THE IDENTIFICATION OF SOME COTTON VARIETIES

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Introduction

The almost total lack of identificatory means for cultivated plants has always represented a huge gap in taxonomic practice, and the problem is particularly acute in the case of such relatively large genera as Rosa, Triticum, Chrysanthemum and Gossypium. So much so in fact that short of consulting the original producer of a given variety of any of these genera, its correct identity cannot be established with any degree of precision. In an attempt to bridge this gap we have embarked upon a key-generating programme for cultivated plants, and have chosen some local cotton varieties for the present exercise which is intended merely as an example to be followed in the case of other genera as well.

A few keys are already on record for the identification of Gossypium species and varieties. Most notable among these keys are those put forward by Denham (1924), Hutchinson et al (1947) and Brown (1958). In Denham's key the major split is based on a correlation between the chromosome numbers and the geographical distribution of the species, and has since been perpetuated in all its essentials by subsequent taxonomic treatments of the genus with only minor innovations in the lower reaches of the key. While this cytological-geographical correlation may be of value in the classification of Gossypium species and infra-specific taxa it can hardly be of use in their identification, since the number of chromosomes is not among the easily accessible features of the plants, while the geographical distribution cannot be 'observed' at all. It therefore follows that the keys based on such a correlation are clearly impracticable.

Material and methods

The material covered 18 cultivated varieties of Gossypium barbadense; several specimens of each variety have been collected from the experimental grounds of the Research Stations at Giza and Bahteem, so that the names attached to these varieties are the official names coined for them by their original producers, and there is therefore no chance of identificatory errors. This is vitally important for the present work, as the value of the keys in which these names will appear rests entirely on the authenticity of those names, especially in the absence of any means for their confirmation.

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Free-hand crossections of mature internodes have been double-stained in safranin and light-green, and semi-permanent pollen preparations have been made according to the simple method of Franks and Watson (1963). For reference purposes, voucher specimens of all varieties as well as the slides prepared from them are kept at the departmental herbarium of Al-Azhar University.

The characters

The characters used in botanical identification should in general be as conspicuous and easily accessible to the independent observer as possible, so that the keys based on them may be equally self-explanatory and easy to use. We have therefore concentrated on recording comparatively only those characters which (a) could be observed with the least possible effort and in the shortest possible period of time, and (b) seem constant for the largest number of specimens of each variety. The following is a list of the characters as recorded for each of the 18 cotton varieties; copies of the full data-matrix will be provided by one of us (M.E.A.) on request:

1. Epicalyx : tepals united at base / free,
2. number of teath per tepal (ranging between 3 and 17),
3. number of main veins per tepal (ranging between 3 and 17),
4. glands on tepal veins present / absent,
5. druses in cells over veins present / absent,
6. Calyx : hairy / glabrous,
7. number of main veins in tube (ranging between 17 and 28),
8. glands on sepal veins present / absent,
9. druses in cells over sepal veins present / absent,
10. teeth acute-caudate / obtuse,
11. Stem : hairy / glabrous,
12. Seeds : fuzzy or semi-nacked / nacked,
13. fuzz white / colored (inapplicable if seeds nacked),
14. Flower : pedicel length in cm. (ranging from 0.6 to 11.0 cm.),
15. pedicel hairy / glabrous,
16. Leaves : petiole hairy / glabrous,
17. lamina hairy on both surfaces / only on lower surface,
18. Leaf-shape: y/b,
19. y/a,
20. y/z,
21. (y+z)/z,
22. m/l,
23. (y+z)/b,
24. (y+z)/l,
25. Stem anatomy: xylem vessels in radial arms / homogeneously dispersed,
26. Pollen : average of 10 diameter measurements in μ (ranging from 60 to 120 μ).

Of all these characters only those defining leaf-shape (characters 18 - 24) need further clarification. The leaves of all 18 cotton varieties studied here are palmately-lobed although they vary considerably in shape from one variety to the next and have been vaguely termed palmatifid, palmatisect and palmatipartite. As a more accurate contribution from leaf-shape to the identification of different cottons, we have devised a set of ratios between the length and breadth of the various parts of the leaves to express in numerical terms their unmistakeable aspects of morphological variation (see Fig. 1), and have scored the average of each of these ratios from ten mature symmetrical leaves for each variety.

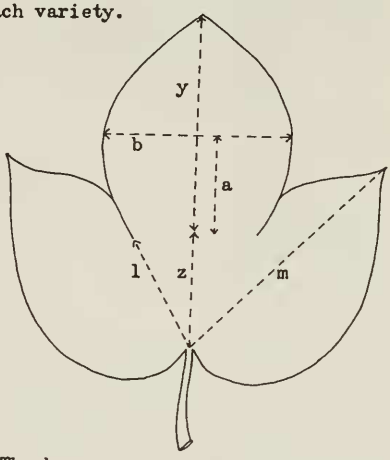

Fig. 1. A diagrammatic representation of a palmately-lobed leaf, showing the distances (a, b, m, l, y and z) used to determine the ratios defining its shape.

The key

The policy adopted in the synthesis of a key from the recorded data aimed primarily at enabling the user of this key to ascertain the correct identity of an unknown cotton variety both easily and speedily. This has been achieved by searching among the recorded observations for combinations of correlated characters which would give maximum contrast between the largest possible number of taxa, and putting the contrasted couplets nearest to each other to give the user maximum visual aid in spotting them in the key. The result of this policy is the following non-indented dichotomous key; it is worth pointing out that both the indented and non-indented types of key are easily inter-convertible so that those who prefer to use the indented type can re-arrange the couplets of the non-indented one given here to suite their own purposes:

1.	Glands on sepal veins present	2
	Glands on sepal veins absent	11
2.	Pedicel hairy	3
	Pedicel glabrous	4
3.	y/a = 3.4, glands on tepal veins present . . .	v Giza 72
	y/a = 4.4, glands on tepal veins absent . . .	v Giza 70
4.	y/b = 2, (y+z)/b = 4 or more	v Giza 73
	y/b = 1.6 or less, (y+z)/b = 3.3 or less . . .	5
5.	y/a = 4.7 or more	6
	y/a = 3.9 or less	7
6.	Tepal 11-veined, druses in cells over sepal and tepal veins present	v Dandara
	Tepal 15-veined, druses in cells over sepal and tepal veins absent	v Bahteem 190
7.	Tepals entirely free	v Giza 30
	Tepals fused at base	8
8.	y/a = 3.9, y/z = 2.5, m/l = 2.3	v Giza 66
	y/a = 3 or less, y/z = 2.2 or less, m/l = 1.7 or less	9
9.	Seeds fuzzy	v Giza 75
	Seeds nacked	10
10.	y/b = 1.4, (y+z)/b = 2.7	v Ashmouni
	y/b = 1.6, (y+z)/b = 2.9	v Giza 7
11.	Seeds fuzzy	12
	Seeds nacked	13
12.	Tepals 8-toothed, glands on tepal veins present, sepal 20-veined	v Giza 69
	Tepals 12-toothed, glands on tepal veins absent, sepal 25-veined	v Giza 74
13.	Tepals entirely free	14
	Tepals fused at base	15
14.	Calyx-tube 25-veined, pollen grains over 115 μ in diameter	v Giza 71
	Calyx-tube 28-veined, pollen grains only 100 μ in diameter	v Giza 68
15.	Calyx-tube 20-veined	16
	Calyx-tube 23-veined	17
16.	Tepals 10-veined, y/a = 2.8, y/z = 3, m/l = 2.8	v Giza 67
	Tepals 13-veined, y/a = 4.2, y/z = 1.5, m/l = 1.8	v Giza 45
17.	Pedicel hairy, (y+z)/z = 4	v Minoufi
	Pedicel glabrous, (y+z)/z = 2.5	v Karnak.

Quite apart from the identificatory value of this key, it has a number of prominent features which may be summed up in the following:

1. It is noticeable that some of the 26 characters listed above and recorded for each of the 18 varieties have not been mentioned in this key, indicating that the original data-matrix (compiled by Abdellah, 1975) has not been used to its full identificatory capacity, and that a number of alternative keys to the same 18 varieties may be based on the same matrix. Those keys may be used in conjunction with the one presented here for confirmation of the results.

2. The common pitfall found in most traditional keys where a pair of contrasted entries of the same couplet are distinguished from each other on the basis of different characters (e.g. one entry defined by leaf-shape and the other by petal color), has been carefully avoided in the present key. Furthermore, when such pair of entries are separated by more than one character, the distinguishing character-states are given in the same order in each entry.

3. Being based on comparative observations, the present key is open for future modification and expansion to accomodate additional taxa.

4. The data-matrix is in itself a permanent record of the plants' names and characters, and with the recent key-generating computer programs (e.g. Goodall, 1968; Hall, 1970; Morse, 1971; Pankhurst, 1974) this matrix becomes indispensible for an on-line key-generating system for cottons of the world.

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